

Amendments to the Specification

Please replace the paragraph beginning at Page 5, line 20 with the following amended paragraph:

The invention claimed herein comprises a modification to the anode catalyst ink layer to increase electron and proton conduction within the device and to reduce methanol transport. Methanol molecules are hindered or prevented from passing through the modified catalyst layer, thereby reducing or eliminating methanol reach into or crossover through the polymer electrolyte membrane. The anode catalyst layer is modified by the dispersal of a binder material throughout the layer comprising both an electronically conductive material, and a proton conductive material, and lignin. In accordance with one preferred embodiment of this invention, the binder material is polyaniline ink, which is a long chain, grafted to lignin. Advantages of this ink in accordance with one embodiment of this invention include (1) the use of ligno-sulfonic acid and *para*-toluene sulfonic acid as dopants where the sulfonic acid in the polymer enables proton conductivity; (2) the use of polyaniline, which is a good electron conductor and which enables the electrons resulting from the oxidation of methanol to transfer to the external circuit; (3) corrosion resistance and adhesiveness, which add to stable bonding of the layer; (4) stability under oxidation and reduction

Serial No.: 10/642,852

conditions because the ink contains a grafted polymer; and (5) improvement in the overall catalytic efficiency because the ink is both electron and proton conductive, thereby reducing the restriction on the transport of the methanol reaction products, such as protons through the electrolyte membrane and electrons to the external circuit.